Factors influencing fixed retention practices in German-speaking Switzerland : A survey

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Abstract: AIM Several surveys evaluate different retention approaches among orthodontists, but none exist for general dentists. The primary aim of this survey was to record the preferred fixed retainer designs and retention protocols amongst general dentists and orthodontists in Switzerland. A secondary aim was to investigate whether retention patterns were associated with parameters such as gender, university of graduation, time in practice, and specialist status. METHODS An anonymized questionnaire was distributed to general dentists (n = 401) and orthodontists (n = 398) practicing in the German-speaking part of Switzerland. A total of 768 questionnaires could be delivered, 562 (73.2 %) were returned and evaluated. Descriptive statistics were performed and responses to questions of interest were converted to binary outcomes and analyzed using multiple logistic regression. Any associations between the answers and gender, university of graduation (Swiss or foreign), years in practice, and specialist status (orthodontist/general dentist) were assessed. RESULTS Almost all responding orthodontists (98.0 %) and nearly a third of general dentists (29.6 %) reported bonding fixed retainers regularly. The answers were not associated with the practitioner's gender. The university of graduation and number of years in practice had a moderate impact on the responses. The answers were mostly influenced by specialist status. CONCLUSION Graduation school, years in practice, and specialist status influence retention protocol, and evidence-based guidelines for fixed retention should be issued to minimize these effects. Based on the observation that bonding and maintenance of retainers are also performed by general dentists, these guidelines should be taught in dental school and not during post-graduate training.

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A survey-based evaluation of influencing factors on fixed retention practices in German-speaking Switzerland

Abstract

Aim: Several surveys evaluate different retention approaches among orthodontists, but none exist for general dentists. The primary aim of this survey was to record the preferred fixed retainer designs and retention protocols amongst general dentists and orthodontists in Switzerland. A secondary aim was to investigate whether retention patterns were associated with parameters such as gender, university of graduation, time in practice and specialist status.

Methods: An anonymized questionnaire was distributed to general dentists (n=401) and orthodontists (n=398) practicing in the German-speaking part of Switzerland. Seven hundred and sixty eight questionnaires could be delivered, 562 (73.2%) were returned and evaluated. Descriptive statistics were performed and responses to questions of interest were converted to binary outcomes and analyzed using multiple logistic regression. Any associations between the answers and gender, university of graduation (Swiss or foreign), years in practice, and specialist status (orthodontist or not) were assessed.

Results: Almost all responding orthodontists (98.0%) and nearly a third of general dentists (29.6%) reported bonding fixed retainers regularly. The answers were not associated with the practitioner's gender. The university of graduation and number of years in practice had a moderate impact on the responses. The answers were mostly influenced by specialist status.

Conclusions: Graduation school, years in practice and specialist status influence retention protocol, and evidence-based guidelines for fixed retention should be issued to minimize these effects. Based on the observation that bonding and maintenance of retainers are also performed by general dentists, these guidelines should be taught in dental school and not during post-graduate training.

Key words:

Fixed retention, survey, influencing factors, specialist status

Introduction

Following active orthodontic treatment, retention is nearly always required to prevent or minimize relapse [18]. Any corrected malocclusion is to some degree prone to instability and therefore the dental alignment attained should be protected. Indeed, most orthodontic patients have unsatisfactory dental alignment 10 years after orthodontic treatment [36], and 20 years post-retention only 10% of the cases have clinically acceptable mandibular alignment [17]. There is consensus among orthodontists that the only way to maintain ideal alignment is some form of permanent retention [4, 17], and that fixed retention is most dependable to counteract relapse and incisor crowding.

A plethora of retention approaches is in use today [3, 31, 34, 41], but only a few studies have compared the performance of different approaches [16, 37], and recommendations on retainer material and design often remain contradictory. Owing to the paucity of scientific evidence, practitioners frequently choose their individual retention approach based on personal preferences and nonscientific criteria [18].

More recently, orthodontists were surveyed with questionnaires to identify similarities in their retention procedures. These investigations on national levels focused on retainer designs and retention protocols amongst orthodontists and were conducted in the United States [27, 38], the Netherlands [31], the United Kingdom [34], Switzerland [13] an in New Zealand and Australia [41]. All surveys revealed that bonded retainers were in some way part of common retention protocol.

It is worth noting that no survey exists evaluating the retention protocols among non-orthodontists. Some general dentists also bond fixed retainers, and since life-long retention is increasingly being advocated, general dentists will be seeing a growing number of patients with bonded retainers. Yet, no study to date has assessed the prevalent attitude to retention among general dentists. It would be of interest to know how many non-orthodontists bond fixed retainers, and if their approach to bonding and monitoring differs from the approach taken by specialists. Moreover, since practitioners tend to select their retention protocol according to personal preferences and not based on scientific criteria, it would be worth discerning if parameters such as gender, dental education or the number of years in practice influence the dentist's opinion on retention.

The aims of this study were therefore (1) to evaluate preferred fixed retainer designs and retention protocols amongst general dentists and orthodontists in the German-speaking Switzerland, and (2) to investigate whether retention patterns are being influenced by gender, university of graduation, time in practice and specialist status.

Material and methods

This cross-sectional study was designed as a post-delivered, self-completed, anonymized survey on fixed retention distributed to general dentists and orthodontists practicing in the German-speaking part of Switzerland. After review of the literature, commonly used fixed retainer devices and protocols were identified. The original questionnaire consisted of 21 mainly multiple-choice questions. The first section addressed the participants' background. It contained questions on age, gender, dental and orthodontic education. The remaining part of the questionnaire consisted of questions on retention materials and design, questions on retainer bonding protocol, monitoring, follow-up and observed side effects.

Pilot testing was performed prior to the main study to ensure that the questions in the questionnaire were easily understood. Nine general dentists and nine orthodontists known to the authors participated in the pilot study and were excluded from the main study. The average time needed to complete the survey was 3.5 min.

Complete lists of the names and addresses of general dentists and orthodontists were obtained from the Swiss Federal Office of Public Health. Within the German-speaking part of Switzerland, all registered orthodontists (n=398) and a random selection of general dentists (n=401) were contacted, resulting in a total of 799 questionnaires, which were distributed together with addressed, pre-stamped return envelopes in July 2012.

The survey concluded approximately 4 months after the initial mailing. The addresses of 19 registered general dentists and of 12 registered orthodontists were not retrievable. Thus, 768 (100%) dentists (i.e., general dentists and orthodontists) were contacted and 562 (73.2%) questionnaires were returned. Forty-three returned questionnaires contained no clinical information (e.g. dentist retired). In total, 519 questionnaires containing clinical information were evaluated, consisting of 319 general dentists and 200 orthodontists (Figure 1).

Statistical analysis

Descriptive statistics were computed with SPSS (IBM SPSS version 20, Armonk, New York, U.S.A.). In order to perform statistical analyses, responses to questions of interest were converted to binary outcomes as shown in Table 1. Four further variables were defined to describe the participant's gender and professional background: gender, university of graduation (Swiss or foreign), years in practice, and specialist status (orthodontist or general dentist). These four variables served as predictors, and multiple logistic regression was implemented to evaluate the association between the predictors and the outcome variables

listed in Table 1. Logistic regression uses odds ratios to quantify the potential associations between outcomes and predictors. The odds are used for binary outcomes and are defined as the probability of an event occurring divided by the probability of the event not occurring in the exposed and unexposed group to the predictor of interest; the odds ratio is the ratio of aforementioned odds. The Hosmer-and-Lemeshow test was used in order to assess goodness of fit. Regression analysis was performed using Stata 12.1 (Stata Corp, College Station, TX, USA). P-values less than 0.2 were considered as indicators of weak associations between outcomes and predictors, and less than 0.05 indicated significant associations.

Results

The overall response rate was 73.2% (n=562). Almost all responding orthodontists (98.0%, n=196) and nearly a third of general dentists (29.1%, n=93) reported bonding fixed retainers regularly (n=289). Their answers to the converted questions are given in Table 1.

Predictors

In both groups, more men (general dentists: 67.6%; orthodontists: 69.7%) than women participated. Most of the general dentists (30.8%) and orthodontists (36.7%) studied at the University of Zurich, followed by the University of Bern (general dentists: 29.2%; orthodontists: 25.6%). Only 14.2% of the general dentists and 17.1% of the orthodontists did not graduate at Swiss universities. The average number of years in practice was 22.8 years for orthodontists (min.: 4 years; max.: 52 years) and a little less for general dentists; 19.9 years (min.: 0 years; max.: 44 years). Of the 519 evaluated questionnaires, 200 (38.5%) were from participants who completed a continuing education in orthodontics of several years.

Influence of predictors on outcome variables

The influence of gender on the chosen outcome variables is given in Table 2, showing that males and females answered most questions similarly. There is however, a tendency that the odds to carry out the first check-up after the first three months and the odds to monitor the retainers for longer than 10 years is 1.5 times higher in males.

The influence of the University (Swiss or foreign) of which the participant graduated is explored in Table 3. Four questions were answered significantly differently between the groups. If educated abroad, the odds that the dentist uses braided/stranded wire is 3.96 times

higher in the upper jaw and 4.79 times higher in the lower jaw compared to those educated in Switzerland. Furthermore, education at a foreign university accounts for bonding lower incisors (OR: 2.88) and sandblasting teeth prior to bonding (OR: 2.26) more often. Moreover, it seems that dentists educated outside Switzerland are more apt to bond maxillary canines to the retainer (OR: 1.59) and less likely to carry out life-long retention (OR: 0.53) than Swiss-educated dentists.

The influence of the number of years in practice is illustrated in Table 4. Although the influence of time in practice is significant in five answers, the odds ratios indicate that the influence is very small, as they vary between 0.97 and 1.04. Overall, very small odds ratios are seen in all assessed outcome variables, demonstrating that the shifts over the years in the approach to fixed retention remain very subtle. With each additional year in practice, dentists use braided/stranded wire in the upper (OR: 1.04) and lower jaw (OR: 1.03) slightly more frequently. Furthermore, the odds of noticing side effects are 1.02 times higher in more experienced dentists. With each additional year of practice, insufficient oral hygiene is considered to be less of a contraindication to bonding fixed retainer (OR: 0.97) and life-long retention is undertaken less often (OR: 0.97). Moreover, there is a tendency that dentists with more years of experience perform a first retention check-up only after the first three months (OR: 1.02) and monitor retainers for less than 10 years (OR: 0.98).

The influence of specialist status on the outcome variables is given in Table 5. Specialists answered seven questions significantly differently, and the remaining four answers also have p-values close to significance. The odds ratios indicate that the influence is substantial, as the odds ratios vary between 0.15 and 7.99. This phenomenon, i.e., very large or very small odds ratios, is present in all evaluated outcome variables.

If continuing education in orthodontics had been pursued, the odds that the practitioner sandblasts a rigid wire and the teeth before bonding fixed retainers are 7.04 and 3.07 times higher, respectively. Specialists bond less frequently canines to maxillary retainers (OR: 0.33) and incisors to mandibular retainers (OR: 0.30). Additionally, a specialist is less likely to wait 3 months or more to check the retainer after bonding (OR: 0.18), but does not tend to monitor fixed retainers for more than 10 years (OR: 0.15). Moreover, orthodontic specialists are much more likely to observe side effects (OR: 7.99).

The odds for specialists to use braided/stranded wire in the upper (OR: 0.59) and lower jaw (OR: 0.58) is lower. Additionally, specialists tend to consider insufficient oral hygiene a problem (OR: 1.61) and they are more likely to recommend life-long retention (OR: 1.75).

Discussion

The response rate of 73.2% is adequate for statistical analysis [40]. It is comparable with previous survey studies on retention performed in other European countries [34, 39], and is only surpassed by one survey carried out in the Netherlands (91.0%) [31]. Interestingly, retention surveys carried out in other continents did not generate such high response rates, with only 59% in Australia and New Zealand [41], and 32.9% [38] or even 18.0% [27] in the United States.

The satisfactory response rate in the present study may be attributed to the discipline witnessed similarly in other European countries, to the short and simple design of the questionnaire, and to adherence to other guidelines aiming at increasing compliance [40], such as including a pre-paid envelope for the return and emphasizing the responder's anonymity.

It is of interest to note that the general dentists' response rate was far better (79.6%) than the orthodontists' (50.3%). This may be because this questionnaire was the third conducted survey for Swiss orthodontists in 2012, probably causing some orthodontists not to have been as compliant as their peers.

Predictors

Data evaluation was not restricted to mere descriptive analyses, but the data were used to examine whether certain predictors would account for the answers given by the participants. The influence of the dentists' gender and professional background has only been considered in very few investigations [34, 38], and not in such a detailed manner. Our results in tables 2-5 indicate that procedures in fixed retention are mostly influenced by specialist status, and to some extend also by the country of graduation (most notably affecting the choice of retainer design), and the years in practice. Yet, potential differences between females and males reported in earlier studies could not be substantiated [34, 38].

The country of graduation may play an important role [15], a factor that becomes evident when comparing the answers provided in national-wide surveys [27, 31, 34, 38, 39, 41]. By clustering graduates of many universities (non-Swiss versus Swiss graduates), this present study did not evaluate the influence exerted by individual universities, but rather discerned the influence of the country of graduation. Observed trends do therefore not reflect the curricula at different universities, rather they are outcomes based on cultural and political factors, such as different national policies in health-service policies. The results reveal that the country of graduation (Non-Swiss versus Swiss) influences the dentist to use braided or

stranded wires (and with it to bond mandibular incisors) over rigid wires, and to be more inclined to sandblast the teeth before bonding. The place of graduation did not affect the answers to any other questions in our questionnaire (Table 3).

There is scientific evidence that the dentist's opinion [38] and professional skills [9, 11] are influenced by experience. The results presented in table 4 concur with these reports and confirm a subtle shift in certain answers owing to the years in practice.

The greatest effect on the answers given was triggered by specialist status. There is evidence of differences between specialists and non-specialists in orthodontic treatment [20] and retention outcomes [32]. The present investigation showed that specialists answer questions on retention very differently. Thus, it could be hypothesized that the clinical disparity reported in the other studies between specialists and general dentists may be based on their different opinion and approach on retention (Table 5).

Outcome variables

Wire material used in the upper and lower jaw (Questions 1 and 2 in tables 1-5)

42.9% of the participants reported the use a stranded or braided wire in the upper, and 40.9% in the lower jaw. The odds of bonding braided or stranded retainers are higher when retention is performed by foreign-educated dentists, and they increase with each year in practice. Conversely, the odds of bonding rigid wires are higher when retention is performed by a specialist.

In contrast to patients with rigid retainers, patients with braided or stranded retainers experience less crowding relapse during retention [1, 29], but suffer more detachments [1] and are more prone to undesirable side-effects [10, 25, 33]. The fact neither wire can be considered generally superior makes the clinical choice subject to the importance attributed to each potential benefit. Hence, the personal opinion – acquired either at different universities or over time – might account for changes in choice. Interestingly enough, specialists prefer to use rigid wires, perhaps because they consider a minor relapse a far less severe complication than detachments and unwanted tooth movement.

Bonding maxillary retainer (Question 4 in tables 1-5)

Almost half (49%) of the participants stated that they incorporate maxillary canines to the retainer. The odds are higher when the retention is designed by dentists not educated in Switzerland and for non-specialists. The different opinions about how many teeth to bond are

probably affected by what the dentist is focusing on: preserving the achieved result or aiming for a low failure rate. Obviously, the more teeth are bonded, the more detachments are apt to occur [2, 32].

Bonding mandibular retainer (Question 5 in tables 1-5)

Over half (56.4%) of the participants stated that they bond mandibular incisors to the retainer. The odds are higher when retention is done by dentists not educated in Switzerland and by non-specialists.

Retainers made of rigid wires are commonly bonded to canines only, while retainers made of braided or stranded wires are generally bonded to incisors as well [10, 21, 24, 30]. Since non-Swiss educated dentists and non-specialists use more braided and stranded wires, the higher odds for the same participants to bond mandibular incisors to the retainer as well do not surprise.

Bonding a rigid wire to *all* mandibular incisors has also been advocated, but more detachments occur than when all the maxillary incisors are bonded [19]. The anatomical predispositions in the mandible might be responsible for this higher failure rate, since narrower inter-bonding distances permit less "play" in the system than in the upper jaw [25].

Sandblasting wire and teeth (Questions 3 and 6 in tables 1-5)

Most participants sandblast the wire (80.2%), but only 32.8% sandblast the teeth prior to bonding retainers. Specialists sandblast both wire and teeth significantly more often before bonding. Education in a foreign university also accounts for sandblasting teeth before bonding more often, yet to a lesser extent.

Sandblasting wire and enamel enhances the surface properties for mechanical retention and thus increases bond strength [5, 21]. Specialists may well become more aware of these scientific reports through their academic postgraduate education.

Insufficient oral hygiene (Question 7 in tables 1-5)

Nearly two thirds of the responders (63.0%) considered insufficient oral hygiene a contraindication for fixed retainers. The longer a dentist has been practicing, the higher the odds that he or she will not consider insufficient oral hygiene to be a contraindication for fixed retention. The appropriateness of lingual fixed retainers as standard retention plan for all patients regardless of their dental hygiene has been questioned [23], but there is no scientific evidence supporting either position. It is therefore the dentists' experience and not his education that has greater impact on the issue of inadequate oral hygiene.

Life-long retention (Question 8 in tables 1-5)

The vast majority of the participants (77.9%) approve of life-long retention. The odds of supporting it are higher if the dentist is a specialist and Swiss-educated, but diminish with each year in practice. As presented in the introduction, relapse of dental alignment is likely to occur [17] and considerable tooth movement during retention is considered to be the rule, not the exception [14, 22]. Permanent fixed retention is promoted by many [4, 14, 17, 27, 31, 34, 41] as bonded retainer do not seem to be detrimental to periodontal health [1, 8]. Even after many years of wear, fixed retainers cause no negative periodontal effects [4], and no significant changes in plaque index, gingiva index or bone level are observed [23].

There are, however, further concerns that have to be raised in regard to fixed life-long retention. Canines bonded to retainers are reportedly significantly more abraded than un-bonded canines [12], light-cured adhesives bonded to lingual retainers are a source of ongoing bisphenol-A release [7], and since relapse of the anterior alignment is partially due to residual facial growth, permanent retention of incisors and canines will probably not eliminate the issue of crowding, but only shift the problem. Hence, crowding or space creation may occur posterior to the retainer, and compensatory incisor torque may also evolve [24].

In the present survey, specialists and Swiss-educated dentists reportedly favor life-long retention, probably because they are more concerned about the stability of the achieved orthodontic result than the other issues mentioned above.

First check-up (Question 9 in tables 1-5)

About half of the respondents (55.2%) reported to perform the first check-up within the first three months after bonding retainers. The odds of recalling a patient within the first three months are significantly higher for specialists. There is, however, also a tendency that male dentists and dentists with less years of practice will carry out a first check-up within the first three months.

Highest failure rates are witnessed during the first months after a fixed retainer has been bonded [32, 35]. This is of considerable importance, since teeth show an increased mobility over the first few months following orthodontic treatment [28]. Thus, a retainer detachment within the first few months following active treatment will be more challenging, as teeth are more likely to migrate further and faster in the initial three-month period than later in retention. In order to prevent or, if necessary, timely counteract undesirable tooth movement, patients should be at brief check-up intervals during the onset of retention. Specialists seem to

be more aware of this, as reflected in the significantly higher odds that they will conduct the first check-up within the first three months after bonding fixed retainers.

Monitoring retainers more than 10 years (Question 10 in tables 1-5)

Only 42.3% of the participants stated that they monitor their patients' retainers longer than 10 years. Specialists monitor their patients for more than 10 years less frequently, and there is a tendency that female dentists and dentists with more years of practice to monitor their patients also less than 10 years.

One reason why specialists might not monitor their patients' retention for more than 10 years (despite approving life-long retention) is that they tend to delegate the retention check-ups to general dentists. Male and female orthodontists have different working patterns, especially in the amount and length of career breaks they take [6]. This dissimilarity could be the reason why the odds are lower for female dentists to monitor their patients for over 10 years. The reason why dentists with more time in practice do not monitor their retainers for longer than 10 years as often is probably because these dentists do not promote life-long retention, and are thus more likely to have the retainer removed during the first 10 years.

Observing side effects despite an apparently-intact fixed retainer (Question 11 in tables 1-5)

Almost two thirds (65.3%) of the participants answered that they notice side effects in spite of apparently-intact fixed retainers. The odds of observing side effects d are significantly higher for specialists and increase with every year in practice.

Unexpected anterior tooth movement has been reported in scientific literature, even without apparent loosening or breakages of the retainer. It occurs mainly in retainers made of braided or stranded wires [10, 26]. About 3-5% of patients receiving a retainer with a flexible stranded wire experience this complication according to estimates [10, 30], often requiring renewed treatment. It is therefore essential that unwanted post-treatment changes be detected early [10, 30], but initial torque differences or tipping might easily be overlooked.

Side effects of an apparently-intact retainer are detected eight times more often by specialists and also more frequently by more experienced dentists. It is reasonable to assume that this finding is not because their retainers produce more undesirable side effects, but rather that specialists and more experienced dentists are more attentive to side effects.

Limitations

Although bias based on confounding is partially accounted for by using a multivariable logistic regression, and the degree of imprecision is indicated by associated confidence intervals, residual confounding and further potential biases related to participants, response rate and design of the questionnaire could have affected the results. Another limitation of the study is that the results cannot be effectively generalized given that this survey addressed only dental practitioners in the German-speaking part of Switzerland.

Conclusions

Using a self-designed multiple-choice questionnaire, the present study is the first to compare fixed retention patterns as practiced by general dentists and orthodontists. Bonded retainers seem to be very popular in Switzerland; they are employed by almost all of the orthodontists (98.0%) and nearly a third of general dentists (29.6%) who completed the questionnaire.

The results indicate that the professional background has a significant influence on how the questions were answered. The answers given provide some evidence that procedures in fixed retention are to some extent significantly influenced by the university from which the participant graduated, the number of years in practice, but most notably, by specialist status.

The very fact that the professional background may account so considerably in regard to the retention approach chosen highlights the need to establish evidence-based guidelines for fixed-retention procedures. This investigation reveals the need that these recommendations be taught at the graduate level in dental school and not to just during postgraduate training.

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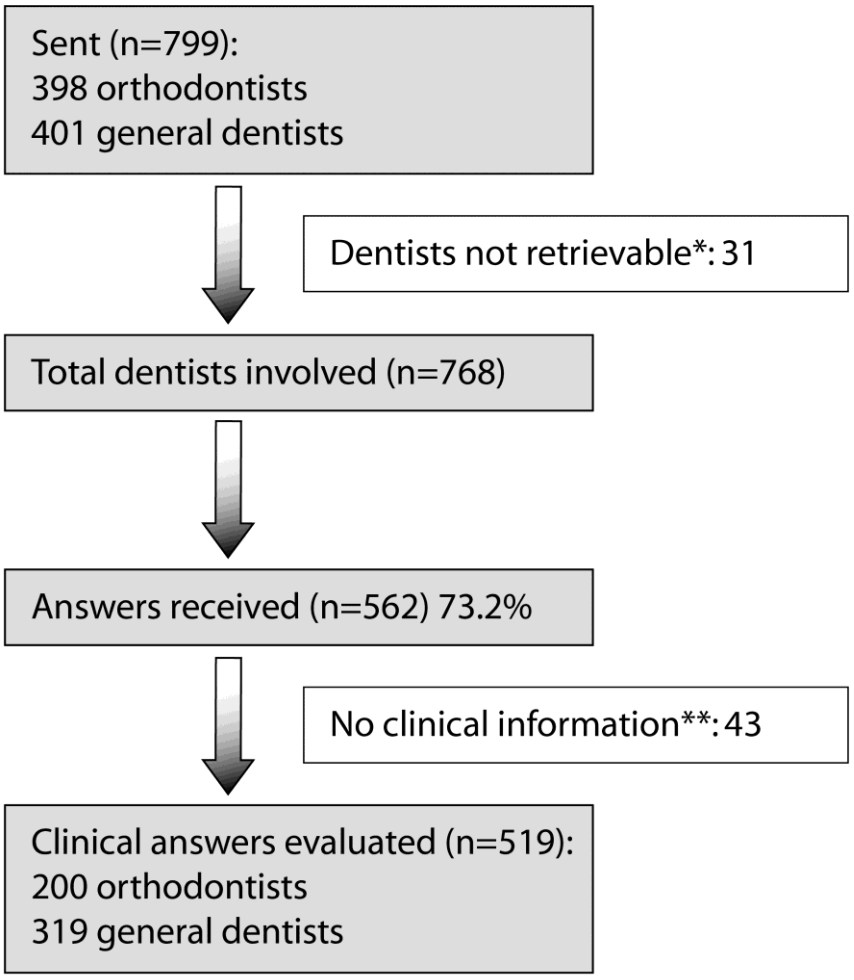
Figure legends

Figure 1*: Return rate of questionnaires*



* e.g. no dentist at presumed address
** e.g. dentist retired

Table 1*: Descriptive analysis: Answers (%) to the converted questions.*

Specification on binary outcome (Yes/No)		Yes	No
1)	**Do you use braided/stranded wire (over rigid wire) in the upper jaw?**	42.9%	57.1%
2)	**Do you use braided/stranded wire (over rigid wire) in the lower jaw?**	40.9%	59.1%
3)	**When rigid wire used: Do you sandblast the wire?**	80.2%	19.8%
4)	**Do you bond maxillary retainers to canines, too?**	49.0%	51.0%
5)	**Do you bond mandibular retainers to incisors, too?**	56.4%	43.6%
6)	**Do you sandblast teeth before bonding?**	32.8%	67.2%
7)	**Do you consider insufficient oral hygiene a contraindication for fixed retainer?**	63.0%	37.0%
8)	**Do you approve of life-long retention?**	77.9%	22.1%
9)	**Do you perform the first check-up only after 3 months?**	55.2%	44.8%
10)	**Do you monitor retainers for more than 10 years?**	42.3%	57.7%
11)	**Do you notice side effects on teeth in spite of retainer being intact?**	65.3%	34.7%

Table 2: *Influence of gender on fixed retainer protocol. Odds ratio (OR) values of gender (predictor), the 95% confidence interval (CI) and p-values are given. OR refers to male vs. female with female being used as reference.*

Specification on binary outcome (Yes/No)		OR (95% CI)	p-value
1)	**Do you use braided/stranded wire (over rigid wire) in the upper jaw?**	0.98 (0.54 ; 1.79)	0.96
2)	**Do you use braided/stranded wire (over rigid wire) in the lower jaw?**	0.85 (0.47 ; 1.55)	0.60
3)	**When rigid wire used: Do you sandblast the wire?**	0.80 (0.29 ; 2.23)	0.68
4)	**Do you bond maxillary retainers to canines, too?**	1.00 (0.57 ; 1.74)	1.00
5)	**Do you bond mandibular retainers to incisors, too?**	1.09 (0.62 ; 1.93)	0.76
6)	**Do you sandblast teeth before bonding?**	0.94 (0.52 ; 1.69)	0.83
7)	**Do you consider insufficient oral hygiene a contraindication for fixed retainer?**	0.91 (0.51 ; 1.62)	0.74
8)	**Do you approve of life-long retention?**	0.66 (0.32 ; 1.33)	0.24
9)	**Do you perform the first check-up only after 3 months?**	1.52 (0.84 ; 2.75)	0.17
10)	**Do you monitor retainers for more than 10 years?**	1.58 (0.84 ; 2.95)	0.15
11)	**Do you notice side effects on teeth in spite of retainer being intact?**	1.23 (0.79 ; 1.92)	0.36

Table 3: *Influence of origin of university degree on fixed retainer protocol. Odds ratio (OR) values of origin of university degree (predictor), the 95% confidence interval (CI) and p-values are given. OR refers to non-Swiss vs. Swiss with Swiss being used as reference.*

Specification on binary outcome (Yes/No)		OR (95% CI)	p-value
1)	**Do you use braided/stranded wire (over rigid wire) in the upper jaw?**	3.96 (1.83 ; 8.59)	<0.01 *
2)	**Do you use braided/stranded wire (over rigid wire) in the lower jaw?**	4.79 (2.19 ; 10.48)	<0.01 *
3)	**When rigid wire used: Do you sandblast the wire?**	0.59 (0.17 ; 2.04)	0.40
4)	**Do you bond maxillary retainers to canines, too?**	1.59 (0.81 , 3.14)	0.18
5)	**Do you bond mandibular retainers to incisors, too?**	2.88 (1.37 ; 6.07)	0.01 *
6)	**Do you sandblast teeth before bonding?**	2.26 (1.15 ; 4.46)	0.02 *
7)	**Do you consider insufficient oral hygiene a contraindication for fixed retainer?**	1.07 (0.53 ; 2.19)	0.85
8)	**Do you approve of life-long retention?**	0.53 (0.25 ; 1.12)	0.09
9)	**Do you perform the first check-up only after 3 months?**	1.36 (0.67 ; 2.78)	0.39
10)	**Do you monitor retainers for more than 10 years?**	0.67 (0.31 ; 1.44)	0.31
11)	**Do you notice side effects on teeth in spite of retainer being intact?**	1.24 (0.69 ; 2.22)	0.48

** Statistical significance*

Table 4*: Influence of time in practice on fixed retainer protocol. Odds ratio (OR) values of time in practice (predictor per year), the 95% confidence interval (CI) and the p-value are given.*

Specification on binary outcome (Yes/No)		OR (95% CI)	p-value
1)	**Do you use braided/stranded wire (over rigid wire) in the upper jaw?**	1.04 (1.01 ; 1.07)	<0.01 *
2)	**Do you use braided/stranded wire (over rigid wire) in the lower jaw?**	1.03 (1.01 ; 1.06)	0.01 *
3)	**When rigid wire used: Do you sandblast the wire?**	0.97 (0.93 ; 1.02)	0.20
4)	**Do you bond maxillary retainers to canines, too?**	0.99 (0.97 ; 1.01)	0.44
5)	**Do you bond mandibular retainers to incisors, too?**	1.01 (0.99 ; 1.04)	0.27
6)	**Do you sandblast teeth before bonding?**	1.00 (0.97 ; 1.02)	0.71
7)	**Do you consider insufficient oral hygiene a contraindication for fixed retainer?**	0.97 (0.94 ; 0.99)	<0.01 *
8)	**Do you approve of life-long retention?**	0.97 (0.94 ; 1.00)	0.03 *
9)	**Do you perform the first check-up only after 3 months?**	1.02 (1.00 ; 1.05)	0.11
10)	**Do you monitor retainers for more than 10 years?**	0.98 (0.95 ; 1.00)	0.10
11)	**Do you notice side effects on teeth in spite of retainer being intact?**	1.02 (1.00 ; 1.05)	0.02 *

** Statistical significance*

Table 5*: Influence of specialist status on fixed retainer protocol. Odds ratio (OR) values of specialist status (predictor), the 95% confidence interval (CI) and the p-value are given. OR refers to specialist vs. non-specialist with non-specialist being used as reference.*

Specification on binary outcome (Yes/No)		OR (95% CI)	p-value
1)	**Do you use braided/stranded wire (over rigid wire) in the upper jaw?**	0.59 (0.34 ; 1.01)	0.06
2)	**Do you use braided/stranded wire (over rigid wire) in the lower jaw?**	0.58 (0.34 ; 1.00)	0.05
3)	**When rigid wire used: Do you sandblast the wire?**	7.04 (3.06 ; 16.18)	<0.01 *
4)	**Do you bond maxillary retainers to canines, too?**	0.33 (0.20 ; 0.57)	<0.01 *
5)	**Do you bond mandibular retainers to incisors, too?**	0.30 (0.17 ; 0.53)	<0.01 *
6)	**Do you sandblast teeth before bonding?**	3.07 (1.66 ; 5.70)	<0.01 *
7)	**Do you consider insufficient oral hygiene a contraindication for fixed retainer?**	1.61 (0.96 ; 2.71)	0.07
8)	**Do you approve of life-long retention?**	1.75 (0.97 ; 3.15)	0.06
9)	**Do you perform the first check-up only after 3 months?**	0.18 (0.10 ; 0.31)	<0.01 *
10)	**Do you monitor retainers for more than 10 years?**	0.15 (0.08 ; 0.26)	<0.01 *
11)	**Do you notice side effects on teeth in spite of retainer being intact?**	7.99 (4.80 ; 13.27)	<0.01 *